

Mechanistic Control of the Crystallization of a Sodalite-type Halozeotype

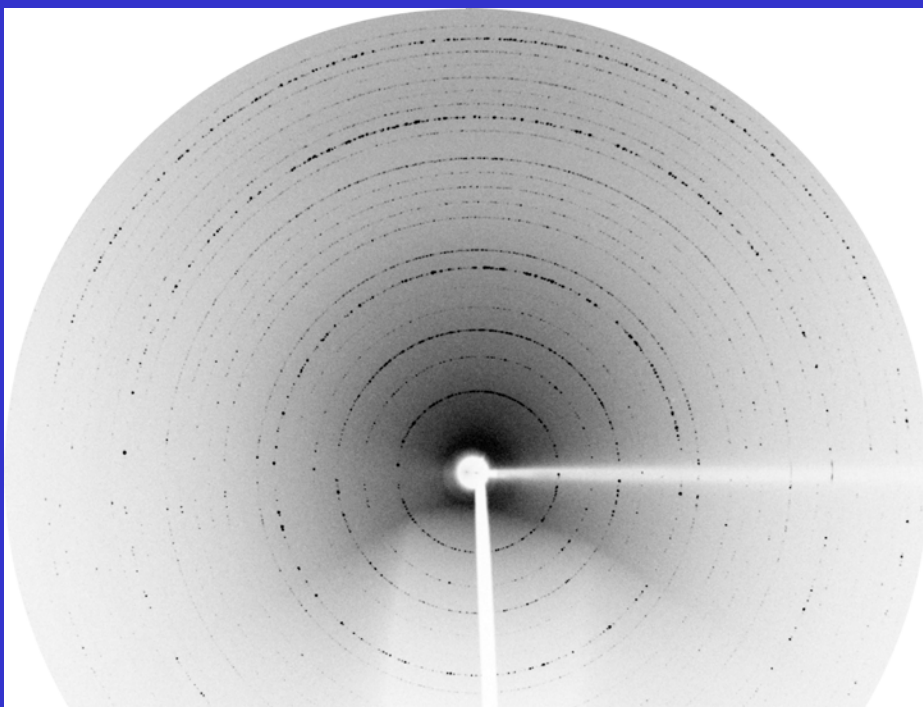
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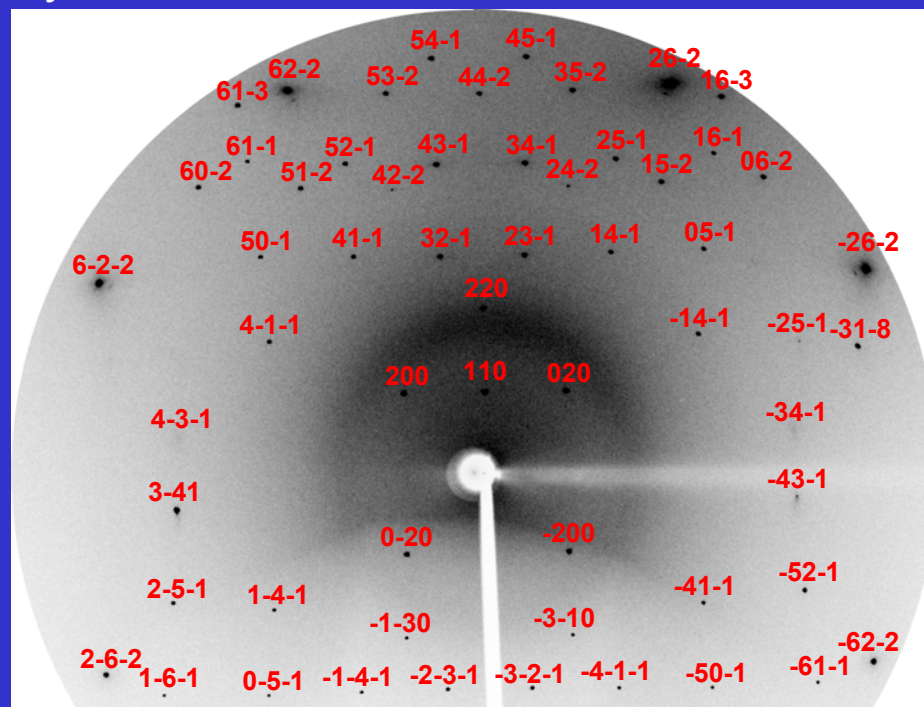
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Control over the mechanism by which crystals are formed is critical to the creation of advanced materials. Using time resolved synchrotron X-ray diffraction we are investigating the mechanism by which halozeotypes form.

Investigation of the mechanism of the crystallization of the sodalite-type CZX-1 demonstrates a 3-D growth mechanism. Furthermore, we have begun to separate nucleation and growth components of the crystallization reaction.



Microcrystalline growth of CZX-1 under conditions where the rates of nucleation and growth are competitive.



Single crystalline growth of CZX-1 under conditions where the rate of nucleation is slow and the rate of growth is fast.

States of Matter:

From the perspective of tennis-ball atoms

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Understanding the structure of a material in its various states of matter at the atomic level is of critical importance to the design of new materials. As our research pursues the frontier of crystal and amorphous materials engineering, fundamental insights from this research are translated into an understanding of states of matter, which is a core component of North Carolina's second grade science curriculum.

Second graders are transformed to the nano-scale through a thought experiment where they are shrunk by a factor of ten a total of eight times such that atoms would appear to be the size of tennis balls.

Juggling the tennis balls provides an approximation of atomic interactions in a gas. Collecting the tennis balls in a trash bag approximates the structure of a liquid in which although the atoms are disorganized, they pack together with neighboring atoms in a similar way as they do in a solid. The students then pack the tennis balls together on a table top to discover the principles of close packing and symmetry in crystals.

